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MINERAL INFORMATION SERVICE

Vol. 4 October 1, 1951 No. 10

MINERAL INFORMATION SERVICE is a monthly news release concerning the mineral resources and industry of CALIFORNIA, designed to inform the public of the discoveries, operations, markets, statistics, and new publications. It is distributed without cost upon request.

OBSIDIAN

Early Uses. Although it has been known for many years that obsidian was widely used by the North American Indians and other aborgines for arrow points, knives, and other weapons and implements employing sharp edges, who would have believed that black obsidian, one of several kinds of volcanic glass, could ever be used for mirrors? Archeological investagators in Peru and Yucatan have uncovered both obsidian and pyrite mirrors. Some of the mirrors are single discs of obsidian and others are mosaics of obsidian fragments cemented together. The mirrors made of obsidian are thick and cumbersome, rectangular or circular, and not as common as those made of pyrite. A long period of time has elapsed since the day when the Mayas made obsidian mirrors; only within recent years has there been any activity and renewed interest in utilizing obsidian for mirrors, especially for telescopes, spectrographs, and various other optical instruments.

Figure 1. Black obsidian from Glass Mountain, Siskiyou County. G. D. Hanna, photography, 1951.

New Uses. During World War II, Dr. G.D. Hanna, of the California Academy of Sciences, conceived the idea of using mirrors made of obsidian for certain naval instruments. The material for this special purpose came from an interesting deposit of obsidian and other volcanic rocks a few miles northeast of St. Helena, Napa County. The obsidian from this deposit was found to be superior to the manufactured glass formerly used for the same purpose because of its extreme opaqueness, hardness, and less susceptibility to scratching in service. Dr. Hanna cut several discs up to 10 inches in diameter from large blocks of obsidian and polished them into optical flats and concave mirrors. The polished surfaces were then aluminized and subjected to many rigorous tests to determine their usefulness in making optical instruments. The tests were highly successful, and it was soon recognized among telescope makers and lens grinders that obsidian was superior to many forms of artificial glass and even comparable to fused quartz.

There are several reasons why obsidian is superior to artificial glass. Mainly, it has a lower coefficient of expansion and a higher rate of heat conduction. The ability of obsidian to conduct heat at a rapid rate eliminates the so-called "heat effects" and "hills" which cause a considerable loss in time when working with artificial glass. In addition, unequal temperature changes in the laboratory have no appreciable effect on optical surfaces made of obsidian.

Properties of Obsidian. Obsidian (fig. 1) is one of several natural glasses, including perlite (now expanded artificially and used as lightweight-aggregate material), pitchstone, vitrophyre, and tachylite. It is a volcanic rock whose composition is essentially the same as that of granite. Although much of the obsidian is black, brown, reddish-brown, gray, and grayish-black colors are found. Much of it is beautifully banded, and some has a mottled appearance due to a mixture of colors. Obsidian has a bright glassy luster, and when broken by even a slight blow, it exhibits a smooth glassy surface.